

AD-A070 787

COMMAND AND CONTROL TECHNICAL CENTER WASHINGTON DC
THE CCTC QUICK-REACTING GENERAL WAR GAMING SYSTEM (QUICK) USERS--ETC(U)
JUN 79

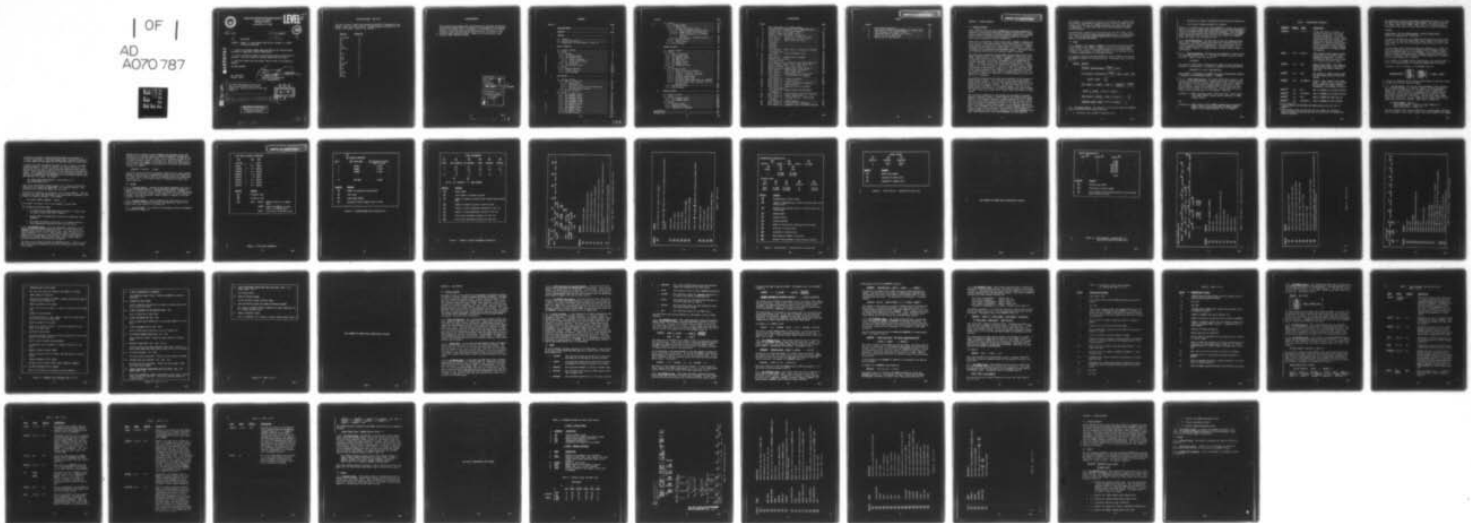
F/G 15/7

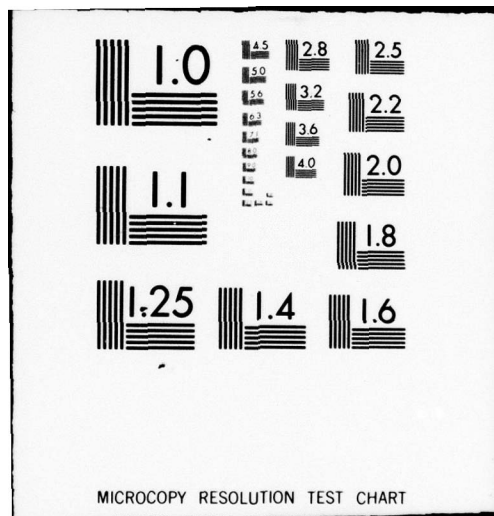
UNCLASSIFIED

CCTC-CSM-UM-9-77-V3-CH-1

NL

| OF |
AD
A070 787







DEFENSE COMMUNICATIONS AGENCY
COMMAND AND CONTROL
TECHNICAL CENTER
WASHINGTON, D. C. 20301

LEVEL III ✓

IN REPLY
REFER TO: C314

11 14 June 1979

12

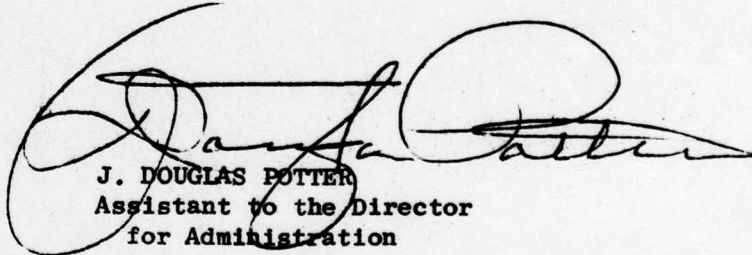
TO: RECIPIENTS

SUBJECT: Change 1 to Users Manual CSM UM 9-77, Volume III, Weapon
Allocation Subsystem

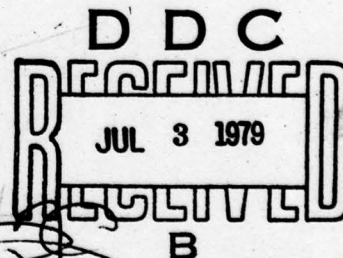
1. Insert the enclosed change pages and destroy the replaced pages according to applicable security regulations.
2. A list of Effective Pages to verify the accuracy of this manual is enclosed. This list should be inserted before the title page.
3. When this change has been posted, make an entry in the Record of Changes.

FOR THE DIRECTOR:

52 Enclosures
Change 1 pages


J. DOUGLAS POTTER
Assistant to the Director
for Administration

The CGTC QUICK-Reacting General War
Gaming System (QUICK) Users Manual.
Volume III. Weapon Allocation Subsystem.
Change 1.



14
CCTC-CSM-UM-9-77-V3-CH-1

DISTRIBUTION STATEMENT A

Approved for public release;
Distribution Unlimited

409 658

JOB

DDC FILE COPY

2820787

EFFECTIVE PAGES - MAY 1979

The list is used to verify the accuracy of CSM UM 9-77 Volume III after change 1 pages have been inserted. Original pages are indicated by the letter 0 and change 1 pages by the numeral 1.

<u>Page No.</u>	<u>Change No.</u>
Title Page	0
ii-v	1
vi	0
vii	1
1-5	0
6-10	1
10.1-10.2	1
11	1
12	0
13-30	1
31	0
32-41	1
42-44	0
45	1
45.1-45.2	1
46-48	0
49	1
50-51	0
52	1
53-106	0
107	1
108-122	0

ACKNOWLEDGMENT

This document was prepared under the direction of the Chief for Military Studies and Analyses, CCTC, in response to a requirement of the Studies, Analysis, and Gaming Agency, Organization of the Joint Chiefs of Staff. Technical support was provided by System Sciences, Incorporated under Contract Number DCA100-75-C-0019. Change set one was prepared under Contract Number DCA100-78-C-0035.

Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DDC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
<i>PER BASIC</i>	
By	
Distribution/	
Availability Codes	
Dist.	Avail and/or special
<i>A</i>	

SEE
AD A055848

CONTENTS

Section	Page
ACKNOWLEDGMENT.....	ii
ABSTRACT.....	viii
1. GENERAL.....	1
1.1 Purpose.....	1
1.2 General Description.....	1
1.3 Organization of Users Manual, Volume III.....	4
2. Module PREPALOC.....	5
2.1 General Purpose.....	5
2.2 Input.....	6
2.2.1 General.....	6
2.2.2 The RECALC Adverb.....	6
2.2.3 The SETTING Adverb.....	7
2.2.3.1 Gaming Parameters.....	7
2.2.3.2 Target Modifications.....	7
2.2.4 The FIX Adverb.....	9
2.2.5 The ONPRINTS Adverb.....	10
2.3 Output.....	10.1
2.3.1 Standard Reports.....	10.1
2.3.2 Optional Reports.....	10.1
2.3.3 Error Messages.....	10.1
3. ALOC MODULE.....	31
3.1 General Purpose.....	31
3.1.1 Modes of Execution.....	31
3.1.1.1 RECALC Mode.....	31
3.1.1.2 Non-RECALC Mode.....	31
3.1.1.3 Mode Selection and JCL Consideration.....	32
3.1.1.4 Non-RECALC Mode Caution.....	32
3.1.2 Attack Increment.....	32
3.2 Input.....	32
3.2.1 The FLAGREST Clause.....	33
3.2.2 The LOCREST Clause.....	33
3.2.3 The MINRANGE Clause.....	34
3.2.4 The MIRVREST Clause.....	34
3.2.5 The MODRANGE Clause.....	35
3.2.6 The ONPRINTS Clause.....	36
3.2.7 The PUNCH Clause.....	36
3.2.8 The READMUL Clause.....	39
3.2.9 The RECALC Clause.....	39
3.2.10 The SETTING Clause.....	39
3.2.11 The SMAT Clause.....	45.1

Section	Page
3.3 Output.....	45.1
3.3.1 Standard Output.....	45.1
3.3.1.1 Input Prints.....	48
3.3.1.2 Standard Allocation Prints.....	48
3.3.1.2.1 Detailed Weapon Allocation Data.....	48
3.3.1.2.2 Summary Weapon Allocation Data.....	58
3.3.1.2.3 Timing Information for ALLOCATE Function.....	58
3.3.1.2.4 Termination of ALLOCATE Function.....	58
3.3.1.3 Detailed Prints.....	60
3.3.1.4 Debug Prints.....	67
3.3.2 Error Messages.....	79
4. MODULE EVALALOC.....	89
4.1 General Purpose.....	89
4.2 Inputs.....	89
4.2.1 Mode of Execution.....	91
4.2.2 The SETTING Adverb.....	91
4.2.3 The ONPRINTS Adverb.....	91
4.2.4 The SORT Adverb.....	91
4.2.5 The TGTMOD Adverb.....	91
4.2.6 The WPNMOD Adverb.....	92
4.2.7 The COUNTRIES Adverb.....	92
4.3 Output.....	92
4.3.1 Standard Output.....	92
4.3.1.1 Target Destruction Summary.....	93
4.3.1.2 Schedule of Weapons Allocated.....	93
4.3.1.3 Schedule of Weapons Delivered.....	97
4.3.1.4 Scheduled Megatonnage.....	97
4.3.1.5 Delivered Megatonnage.....	97
4.3.1.6 Allowable Weapon Type Names for WPNMODIF..	97
4.3.1.7 Revised Weapon-Target Parameter for Plan Reevaluation.....	101
4.3.2 Nonstandard Output.....	101
4.3.3 Error Messages	101
5. MODULE ALOCOUT.....	107
5.1 General Purpose.....	107
5.2 Input.....	107
5.2.1 The ONPRINTS Adverb.....	107
5.2.2 The FINDMIN Adverb.....	108
5.3 Output.....	108
5.3.1 Standard Output.....	108
5.3.2 Nonstandard Output.....	108
5.3.3 ALOCOUT Error Messages.....	108
DISTRIBUTION.....	119
DD Form 1473.....	121

ILLUSTRATIONS

Figure		Page
1	Major Subsystems of the QUICK System.....	2
2	Procedures and Information Flow in QUICK/HIS 6000.....	3
3	Standard Print of User-Input Parameters.....	11
4	Standard Target Data Summary Print.....	12
5	Summary of Fixed Assignment Information.....	13
6	Print Option 1: Penetration Corridor Data Print.....	14
7	Print Option 1: Depenetration Corridor Data.....	16
8	Print Option 1: Refuel Point Data Print.....	17
9	(Deleted).....	17
10	(Deleted).....	18
11	(Deleted).....	19
12	(Deleted).....	20
13	Print Option 2: Weapon Group to Penetration Corridor Distance Print.....	21
14	Print Option 3: Target Information Print.....	22
15	(Deleted).....	23
16	Print Option 4: Planning Factor Changes.....	24
17	PREPALOC Error Messages.....	25
18	ALOC Input Print.....	49
19	Basic Weapon Group Information Print (Print Option 1)..	53
20	Defended Target Summary Print (Print Option 16).....	55
21	Weapon Allocation Print (Print Option 2).....	56
22	Weapon Allocation Summary Print (Print Option 4).....	59
23	Print Option 5 -- Target Weight Information.....	61
24	Print Option 6 -- Basic Target Data.....	62
25	Print Option 7 -- Weapon/Target Interaction Data.....	63
26	Print Option 11 -- Initial Values of Lagrange Multipliers.....	64
27	Print Option 23 -- Timing Information.....	65
28	Print Option 25 -- Inactive Array.....	66
29	Print Option 26 -- Bomber Penetration Probability.....	68
30	Print Option 8 -- RISK Array Print.....	69
31	Print Option 9 -- Marginal Value for Currently Allocated Weapons.....	70
32	Print Option 10 -- Weapon Profit and Efficiency Information.....	72
33	Print Option 12 -- Weapon Target Calculation Synopsis..	73
34	Print Option 13 -- Payoff Calculations.....	75
35	Print Option 19 -- Planning Factors - Terminal BMD Targets.....	76
36	Print Option 20 -- WADOUT Summary.....	77
37	Print Option 21 -- Allocation Error Estimates.....	78
38	Print Option 22 -- Marginal Value of Potential Weapons.	80

TABLES

Number		Page
1	Game Related Parameters.....	8
2	Description of Print Option Numbers for Program ALOC...	37
3	Input Parameter Card Specifications.....	40
4	Acceptable Values for SMAT Array Indices.....	46
5	Default Values for SMAT Array.....	46
6	SMAT Array for MIRV Systems.....	47

SECTION 2. MODULE PREPALOC

2.1 General Purpose

Module PREPALOC (executed after PLANSET) has four major capabilities: updating of weapon group and target attributes, modification of target values, damage constraints and height-of-burst specification, preparation of data for the fixed weapon assignment capability of module ALOC, and the geographical related parameters.

Weapon groups formulation resides within module PLANSET. PREPALOC permits the user to add weapon strikes (called overallocation) to weapon groups whereby providing the allocation greater flexibility in making assignments which ignore serial constraints. The allocator attempts to assign the true inventory plus the added weapons. The Sortie Generation subsystem selects only the inventory number of strikes.

The second major capability of this module is the modification of the target characteristics, VTO, MINKILL, and MAXKILL. VTO is the value of the target relative to the others. MINKILL is the minimum fraction of value that must be destroyed, and MAXKILL is the maximum desired fraction destroyed. Any of these parameters may be changed for any target. The change requests can change these parameters for a single target or for a set of targets. The set of targets for which a change is requested is identified by target class, type, and individual identifier (target designator code (DESIG)), or any combination of these. For complex targets, the class, type, and designator code of each component will be checked to determine if a target parameter for the complex is to be changed.

An additional planning factor which can be modified in this program is weapon height of burst. In the absence of any user specifications, QUICK uses the height of burst for each weapon/target combination that produces the most damage. However, the user can specify use of air or ground bursts in preference to the optimal height. The user can request ground or air bursts on the basis of weapon type, target designator code, target type, target class, target country location, or target region.

The third major capability is the request for allocation of specific weapons to specific targets. (These requests are called "fixed assignments.") This fixing of weapons to targets enables the user to determine part of the weapon allocation while leaving the allocation module free to determine the remaining allocation. In addition, the time of arrival at target or salvo launch number can be fixed for missile weapons. This information will be passed to module PLANOUT which will adjust the launch time accordingly. The specified fixed assignment of weapons remains in effect for the remainder of the plan generation process. Later modules will retain the assignments as best possible.

(For example, it is possible to fix a set of weapons from a weapon group with multiple independently targetable reentry vehicles (MIRV) in such a manner that there are no feasible footprints that cover that target set adequately. In that case, some of the fixed assignment requests must be ignored.)

The fourth major capability is the calculations and IDS storage of all distances and attrition between corridor doglegs for use by other processors. Also the distance between depenetration corridor and recovery bases is calculated and stored.

2.2 Input

2.2.1 General. Text English commands to this module permit the setting of new target values, MINKILL or MAXKILL as well as specifying weapon height of burst. Also certain gaming parameters are set which define the game to be executed. One final consideration is permitting the user to directly assign weapons to individual targets.

This module recognizes the verb PREPARE and adverbs SETTING, FIX, RECALC, and ONPRINTS (request for optional prints). The general form of the command is:

$$\begin{aligned}
 & \text{PREPARE} \left[\text{RECALC} \right. \\
 & \quad \left[\text{SETTING} \left[\text{game-parameter} \left\{ \begin{array}{c} \text{EQUAL} \\ = \end{array} \right\} \text{value} \right] \right. \\
 & \quad \left[(\text{attribute-1}, \text{attribute-2}) \left\{ \begin{array}{c} \text{EQUAL} \\ = \end{array} \right\} (\text{value}, \text{value}) \left[\text{AND} \right. \right. \\
 & \quad \quad \left. \left. (\text{value}, \text{value}) \dots \right] \right] \left. \right] \\
 & \quad \left[\text{FIX} (\text{DESIG} \left[\text{DESIG} \right] \text{GROUP} \left[\left\{ \begin{array}{c} \text{SALVO} \\ \text{ARRIVE} \end{array} \right\} \right] \left\{ \begin{array}{c} \text{EQUAL} \\ = \end{array} \right\} \right. \\
 & \quad \quad \left. (\text{desig} \left[\text{desig} \right] \text{value} \left[\text{value} \right] \right) \left. \right. \\
 & \quad \left[\text{AND} (\text{desig} \left[\text{desig} \right] \text{value} \left[\text{value} \right] \dots) \right] \left. \right] \\
 & \quad \left[\text{ONPRINTS number number, first-last number} \dots \right]
 \end{aligned}$$

2.2.2 The RECALC Adverb. The presence of this adverb causes the PREPALOC module to carryout the following functions:

- o Calculation and storage of geographic data

- o Calculation of weapon overallocation data and salvo information
- o Presetting of gaming parameters to defaults.

Absence of the RECALC adverb will cause PREPALOC to bypass these functions. The user may wish to bypass these functions in order to save processing time if the PREPALOC module has already been employed. Fixed assignments normally have been entered after an execution of PREPALOC in the RECALC mode. Non-RECALC execution modes (with no intervening tape RESTORES) simply adds data to the existing data base.

2.2.3 The SETTING Adverb. Two main sets of data are considered under this clause. The first permits the definition of variables that will finalize the game scenario being executed. The second allows the user to set attributes in various combinations of subsets whereby target value, MINKILL, MAXKILL or height-of-burst overrides previous inputs or calculations.

2.2.3.1 Gaming Parameters. The user has the capability to input values for parameters given in table 1. If inputs are absent, default values are used. Simply, values are entered as:

INITSTRK=1

For any given weapon group, weapons will be added for sortie generation constraint considerations. The number of weapons in each group will be

$WEAPONS * (1.0 + PEX + (EXN / VEHICLES))$

where WEAPONS and VEHICLES are PLANSET determined; PEX=PEXBOMB, PEXMISS, or PEXMIRV; and EXN=EXNBOMB, EXNMISS, or EXNMIRV.

2.2.3.2 Target Modifications. The target modification portion of the setting clause allows the user to change target value, minimum or maximum required destruction fraction, and height of burst on any target or set of targets. In the general command sentence given above, generic word attribute-1 refers to the identification of the target set over which a specific change is to be effective. Generic word attribute-2 refers to the attribute that is to be changed. Therefore:

attribute-1 = DESIG (designator code), TYPE (type name), CLASS (target class name), CNTRYL (target country location), or IREG (target region)

and

attribute-2 = VALUE (target value), MINKILL (minimum value destroyed), MAXKILL (maximum value destroyed), or IDHOB ((target height of burst specification), 'AIR' or 'GROUND')

Table 1. Game Related Parameters

<u>MNEMONIC</u>	<u>DEFAULT</u>	<u>RANGE</u>	<u>DESCRIPTION</u>
INITSTRK	1	1 or 2	Strike type (first or second). In the first strike case, the launch timing is determined by the other two input parameters. In the second strike case, all alert weapons launch after their specified alert delay (ALRTDL), all nonalert weapons launch after their nonalert delay (NLRTDL), and the detailed coordinated missile timing parameters in program PLANOUT are ignored.
CORMSL	0.0	0.0-1.0	Gross missile launch timing. Defined as the fraction of missile flight completed at time zero. A value of 0.0 specifies missile launch; a value of 1.0 specifies missile impact.
CORBOMB	0.0	≥ 0.0	Bomber launch timing. The number of nautical miles prior to the corridor entry that each bomber reaches at time zero.
PEXBOMB*	0.0	≥ 0.0	The fraction of bomber weapons added for each weapon group for over allocation.
EXNBOMB*	3.0	0.0-1000.0	Vehicle 'loads' added to each bomber group. A vehicle 'load' is the ratio of the number of weapons (PLANSET determined) to the number of vehicles
PEXMISS**	0.0	≥ 0.0	Same as PEXBOMB for non-MIRV missiles
EXNMISS**	0.0	0.0-1000.0	Same as EXNBOMB for non-MIRV missiles
PEXMIRV**	0.1	≥ 0.0	Same as PEXBOMB for MIRV missiles
EXNMIRV**	2.0	0.0-1000.0	Same as EXNBOMB for MIRV missiles

* These parameters are modified for bomber groups with less than 15 bombers.

** These variables must be such that the total number of vehicles per group (including overallocation) does not exceed 1030 for bomber and 1130 for missiles.

Any combination of target subsetting is permissible but there is a ranking order in the final storage of input values. The order of priority is: DESIG, TYPE, CLASS, CNTRYL, IREG. That is, if a given target is referenced by more than one output target set, the cited order applies.

Consider:

(TYPE,VALUE) = B52,10) (CNTRYL,VALUE) = (US,20) (CLASS,VALUE) = (MISSIL,10) (DESIG,VALUE) = (AB123,30)

In terms of the hierarchy, all targets located within the US will have a value of 20; all B52s and MISSILs will have a value of 10 (even if located within the US); and the individual target AB123 will have a value equal to 30.

If some targets within the given subset are components of a target complex, the planning factors for the complex would be changed to agree with the modified values for the components. If an attempt is made to modify the same planning factor for a complex target as a whole, and also on a component of that complex, the former change will be effected and the latter change will be ignored.

In the absence of a height-of-burst specification, the optimal height is used. When changing VALUE, the normalized VALUE should be entered.

In summary, then, this phrase of the SETTING clause is:

$$\text{PREPARE SETTING } \left(\begin{array}{c} \text{DESIG} \\ \text{TYPE} \\ \text{CLASS} \\ \text{CNTRYL} \\ \text{IREG} \end{array} \right) \cdot \left(\begin{array}{c} \text{VALUE} \\ \text{MINKILL} \\ \text{MAXKILL} \\ \text{IDHOB} \end{array} \right) = (\text{value}, \text{value}) \dots$$

A setting of IDHOB may also be used to preset height of burst for a weapon type (the attribute altered is WHOB).

2.2.4 The FIX Adverb. The optional fixed assignment clause specifies the allocation of weapons to specific targets. A fixed assignment of weapons from a specific group to a specific target is maintained by module ALOC, which optimizes the assignment of the nonfixed weapons. In addition, the delivery time (minutes relative to H-hour) of non-MIRV missile weapons may be specified. Also the salvo launch number may be user controlled. Any one command may not contain both the salvo number and arrival time, however. These direct commands are:

FIX (DESIG,GROUP) = (AB123,4)
 (DESIG,GROUP,ARRIVE) = (AD187,6,.5) AND (FA001,92,1)
 (DESIG,GROUP,SALVO) = (FE001,7,1)

The first command fixes a weapon from group 4 to target AB123, and down-time is dependent on the time of flight. The second command fixes weapons

from groups 6 and 92 to targets AD187 and FA001 with downtimes of .5 and 1, respectively. The third command fixes a weapon from group 7 to target FE001 and the weapon will be launched within the first salvo.

In many cases fixed assignments are made to sets of targets that have sequential DESIGs. In order to capture this often used option, it is permissible for the user to input a string of DESIGs for many targets thereby fixing one weapon group from the indicated weapon group on each target. This command is an expansion on the individual assignment command and is recognized by the appearance of the word DESIG entered twice and separated by a comma. For example:

```
FIX (DESIG,DESIG,GROUP,ARRIVE) = (AB127,AB227,5,1,0)
AND (AB228,AB230,6,1,0)
```

Group 5 will have weapons fixed assigned to all targets starting with DESIG AB127 and ending with DESIG AB227 (101 separate targets). The alpha-portions of these two DESIGs must be equal.

An additional capability is provided by the attribute NUMALOC. The user specifies that more than one weapon of the group named be assigned to the target (or targets) specified. For example:

```
FIX (DESIG, GROUP, NUMALOC) = (AB321, 7, 5)
```

Five weapons from group 7 are to be assigned to target AB321.

The following constraints apply:

- o No weapons from a bomber group may be fixed on a target which has been allocated more than 30 weapons.
- o No more than 30 weapons may be fixed on an undefended target (MISDEF=0).
- o The number of weapons in any group is the maximum number of fixed assignments which may be made from that group.

2.2.5 The ONPRINTS Adverb. It is not necessary to generate all permissible prints for every PREPALOC execution. For this reason, the ONPRINTS adverb permits the selection of up to four separate print requests numbered 1, 2, 3, or 4. Print request number 1 supplies geographical related reports; request number 2 supplies weapon group related prints; request number 3 prints target data; request number 4 generates target data as modified by user inputs.

The proper print requests follows the ONPRINTS adverb. A series of numbers (in any order) separated by at least a single space turns on the print requests.

Options 3 and 4 produces prints concerning the available target list. If desired, the user may request a subset of targets to be printed by specifying the first and last target. This is possible through the use of special operators comma (,) and dash (-). After the number 3 or 4 the starting target number to be printed will follow the comma operator and the last target number to be printed will follow the dash operator. Consider the command:

ONPRINTS 2 3,10-1297 4,1000

Prints for option two will be generated; target data for target numbers between 10 and 1297 will be generated for option three; and target data for target numbers between 1000 and the maximum value will be generated for option four. If the comma operator is missing print begins with target number one.

2.3 Output

2.3.1 Standard Reports. Standard prints appear depending upon user employment of specific options. Gaming parameters (figure 3) appear if RECALC is specified and/or any parameter is changed via a SETTING clause. The target data summary (figure 4) also appears in the case of RECALC or changes. The fixed assignment summary (figure 5) appears if the input contains a FIX clause.

2.3.2 Optional Reports. Reports generated for print option one are given in figures 6 through 8; figure 13 for option two; figure 14 for option three; and figure 16 for option four.

2.3.3 Error Messages. All possible error messages produced for PREPALOC are explained in figure 17.

USER INPUT PLANNING PARAMETERS

①		②	③
INITSTRK	=	1	INPUT
CORMSL	-	0.5	INPUT
CORBOMB	=	0.0	DEFAULT
PEXBOMB	=	0.0	DEFAULT
EXNBOMB	-	3.0	DEFAULT
PEXMIRV	-	.05	INPUT
EXNMIRV	=	2.0	DEFAULT
PEXMISS	=	0.0	DEFAULT
EXNMISS	=	0.0	DEFAULT

HEADINGMEANING

①	Parameter name
②	Parameter value
③	Mode: DEFAULT - default value set in RECALC mode UNCHNG - value of parameter at beginning of non-RECALC mode INPUT - value input in SETTING clause

Figure 3. User-Input Parameters

① 684 TARGETS PROCESSED			
② I	③ CLASS NAME	④ FRACTION OF TOTAL VALUE IN CLASS	
1	MISSIL	0.2500	
2	BOMBER	0.3500	
3	TANKER	0.1000	
.	.	.	
.	.	.	
.	.	.	
15	NOT USED	0.0000	

<u>HEADING</u>	<u>MEANING</u>
①	Number of targets as seen by ALOC
②	Line count
③	Class name (CLASS)
④	Fraction of total target value in class

Figure 4. Standard Target Data Summary Print

FIXED ASSIGNMENTS					
①	②	③	④	⑤	⑥
GROUP	TOTAL WEAPONS	ADJ WEAPONS	FIXES	REQUESTS	HONORED
1	100	110	23	10	10
3	120	120	120	120	120
7	20	25	0	5	0
11	50	50	50	10	7
	⑦	⑧			
OUT OF 145 REQUESTS 137 WERE HONORED					
<u>HEADING</u>		<u>MEANING</u>			
①	Group number				
②	Total number of weapons in group				
③	Number of weapons in group after overallocation adjustment				
④	Number of weapons in group currently fixed				
⑤	Number of fixed assignments requested in this run				
⑥	Number of fixed assignments honored by this run				
⑦	Total fixed assignment requests for this run				
⑧	Total fixed assignments honored for this run				

Figure 5. Summary of Fixed Assignment Information

PENETRATION CORRIDOR DATA							
①	②	③	④	⑤	⑥	⑦	⑧
CORNUM 1	LAT 29.0000	LONG 217.1000	KORSTY 5	HILOAT 3.0000	DEFRAN 250.0000	ATTRSU .0001	ATTRCO .0005
DOGLEG ⑨	LAT ⑩	LONG ⑪	ATTRLE ⑫				
1	28.0000	210.0000	.0001				
2	29.5000	220.0000	.0000				
	⑬	⑭					
LENGTH - .7500E+02 ATTRITION - .0005							
PRECORRIDOR DEFENSES -- SECTORS 1 ⑮							
SECTOR ⑯	DISTDEF ⑰	PRATTR ⑱					
1	.7500E+2	.0005					
HEADING		MEANING					
①		Penetration corridor number					
②		Latitude of corridor axis orientation point					
③		Longitude of corridor axis orientation point					
④		Exponent for definition of curvilinear coordinates					
⑤		Ratio of high altitude attrition to low altitude attrition					
⑥		Characteristic distance defining rate of change from suppressed attrition to normal attrition					
⑦		Attrition probability per nautical mile (suppressed)					

Figure 6. Print Option 1: Penetration Corridor (Part 1 of 2)

<u>HEADING</u>	<u>MEANING</u>
⑧	Attrition probability per nautical mile (normal)
⑨ through ⑫	Prints ⑨ through ⑫ appear only if there are doglegs associated with this corridor.
⑨	Dogleg number
⑩	Latitude of dogleg
⑪	Longitude of dogleg
⑫	Attrition in dogleg
⑬	Total length of corridor doglegs
⑭	Total attrition of corridor doglegs
⑮ through ⑱	Prints for ⑮ through ⑱ appear only if corridor has defended section
⑮	Number of defended sectors
⑯	Defended sector number
⑰	Length of defended sector
⑱	Attrition associated with defended sector

Figure 6. (Part 2 of 2)

DEPENETRATION CORRIDOR DATA

CORIDOR = ① 1 DISTEG = ② .0000 DISTEF = ③ 120.0000

④ DOGLEG	⑤ LAT	⑥ LONG
1	43.0000	222.0000
2	43.0000	222.0000

RECOVERY BASES

⑦ DESIG	⑧ LAT	⑨ LONG	⑩ CAPACITY	⑪ DISTANCE
AB102	41.0000	222.0000	10	120.000
AC201	41.0000	221.0000	20	189.500

HEADING

MEANING

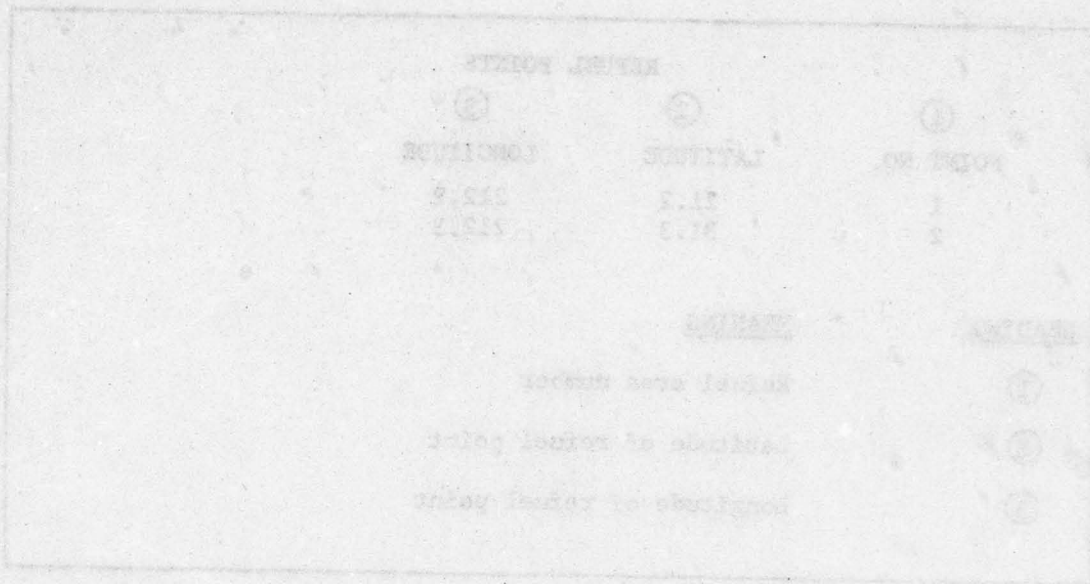
- ① Depenetration corridor number
- ② Length of depenetration corridor (nautical miles from entry to end)
- ③ Distance from corridor entry to recovery point (nautical miles)
- ④ Dogleg number
- ⑤ Dogleg latitude
- ⑥ Dogleg longitude
- ⑦ DESIG of recovery base associated with corridor
- ⑧ Latitude of recovery base
- ⑨ Longitude of recovery base
- ⑩ Base capacity (number of aircraft)
- ⑪ Distance from corridor to base (nautical miles)

Figure 7. Print Option 1: Depenetration Corridor Data

REFUEL POINTS		
①	②	③
POINT NO.	LATITUDE	LONGITUDE
1	21.2	212.2
2	31.3	212.3

<u>HEADING</u>	<u>MEANING</u>
①	Refuel area number
②	Latitude of refuel point
③	Longitude of refuel point

Figure 8. Print Option 1: Refuel Point Data Print



THE CONTENTS OF THESE PAGES INTENTIONALLY DELETED

WEAPON CHARACTERISTICS

GROUP ①	CORNUM ②	DISTAC ③
1	1	0.000
	2	0.000
	3	2931.083
	4	4763.809
	5	5187.943
	6	3516.968
	7	3843.813
2	1	0.000

HEADING

MEANING

- ① Weapon group number
- ② Penetration corridor number
- ③ The distance from the group centroid to the corridor entry (nautical miles)

Figure 13. Print Option 2: Weapon Group to Penetration Corridor Distance Print

TARGET INFORMATION PRINT

TGTNUMB 12 ① NAME = MOSCOW ② INDEX NO = 1234 ③ DESIG = AB123UR11 ④ TASK = 114 ⑤
 TGTMULT = 1 ⑥ LAT = 45.2000 ⑦ LONG = 212.8000 ⑧
 INDYPEN = 4 ⑨ DISTEG = 213.0000 ⑩ DISTDG = 514.2000 ⑪ DISTDF = 317.2000 ⑫ IDHOB = GROUND ⑬

ICORR ⑭	DISTCD ⑮	ATTRCD ⑯
1	0.0000	0.0000
2	0.0000	0.0000
3	201.4000	0.0005

HEADING

MEANING

- ① Target number (assigned by PLANSET)
- ② Target name
- ③ Target index number
- ④ Target DESIG/country location code/flag code
- ⑤ Target SIOP table number
- ⑥ Target multiplicity
- ⑦ Target latitude
- ⑧ Target longitude

Figure 14. Print Option 3: Target Information Print (Part 1 of 2)

<u>HEADING</u>	<u>MEANING</u>
⑨	Number of closest depenetration corridor
⑩	Length of depenetration corridor (nautical miles)
⑪	Distance from target to recovery base (nautical miles)
⑫	Distance from target to end of depenetration corridor
⑬	User selected height of burst for target
⑭	Penetration corridor number
⑮	Distance to corridor origin from target (nautical miles)
⑯	Attrition parameter, corridor origin to target (this value is used as the exponent in the attrition probability calculation)

Figure 14. (Part 2 of 2)

PLANNING FACTORS										
① TGTN- 5	② NAME-MOSCOW	③ INDEX-2131	④ DESIG-AB123UR11	⑤ CLASS-U/I	⑥ TYPE-RCITY	⑦ VN-06PO	⑧ VAL-21.40	⑨ MINK=-.50	⑩ MAXK=-.75	⑪ G
⑫ GROUP	⑬ ARRIVE	⑭ SALVO								
94	1.0	5								
13		2								
4		0								
<u>HEADING</u>			<u>MEANING</u>							
①	Target number									
②	Target name									
③	Target index number									
④	Target DESIG/country location code/flag code									
⑤	Target CLASS									
⑥	Target type									
⑦	Target vulnerability number									
⑧	Target value									
⑨	Target minimum required damage									
⑩	Target maximum required damage									
⑪	Target selected height of burst (A - air, G - ground)									
⑫	Prints ⑫ through ⑭ appear only if target has fixed assignments									
⑬	Group number of assigned group									
⑭	Preset time of arrival (blank if not set)									
⑮	Assigned salvo number (0 if non-salvoed group)									

Figure 16. Print Option 4: Planning Factor Changes

- 1 **UNEXPECTED END TO FIX CLAUSE**
The input FIX clause has ended in the middle of a phrase.
- 2 **ERROR CAUSED BY (5(2X,012))**
Follows error messages in FIXWEP. Fields contain octal dump of offending input instruction.
- 3 **ERROR IN SUBJECT OF FIX CLAUSE**
Input error occurs in subject -- that is to the left of an equal sign.
- 4 **SKIPPING TO NEXT SUBJECT**
Processing proceeds to next subject -- that is to next collection to the left of an equal sign.
- 5 **ERROR IN OBJECT OF FIX CLAUSE**
Input error occurs in object -- that is a collection to the right of an equal sign.
- 6 **SKIPPING TO NEXT OBJECT**
Processing proceeds to the next object collection of the current subject or the next subject.
- 7 **TYPE OF VALUE IN OBJECT DOES NOT MATCH**
An alphabetic value assigned to a numeric attribute or vice versa.
- 8 **NUMBER OF ITEMS IN OBJECT ERROR**
Object collection does not contain the same number of items as subject.
- 9 **ILLEGAL ATTRIBUTE IN FIX CLAUSE**
Attribute must be DESIG, GROUP, SALVO, ARRIVE or NUMALOC
- 10 **TOO MANY ATTRIBUTES IN FIX CLAUSE**
Only five attributes are allowed in any one subject.

Figure 17. PREPALOC Error Messages (Part 1 of 3)

11 ILLEGAL COMBINATION OF ATTRIBUTES

Only DESIG may appear twice -- SALVO and ARRIVE are mutually exclusive.

12 MISMATCH IN DESIG RANGE

Either alphabetic portions are not equal or second numeric portion is less than first.

13 FIXWEP ASSIGNMENT HAS NON-EXISTANT DESIG (A6)

Value is DESIG not in data base.

14 FIXWEP ASSIGNMENT NOT LEAD (A6)

Value is DESIG which exists but is a non-lead element of a complex.

15 FIXWEP ASSIGNMENT NOT IN LIST (A6)

Value is DESIG which exists but is not in target list.

16 FIX REQUEST EXCEEDS GROUP SIZE (I5) (A6)

Group completely fixed. Values are group number and desired DESIG.

17 NEGATIVE LAUNCH TIME (I5) (A6) (F10.5)

Desired arrival time caused negative launch time. Values are group number DESIG and input arrival time (fix is still honored)

18 NO SALVO AVAILABLE (I5) (A6)

All group salvoes exhausted. Values are group number and DESIG.

19 DESIRED SALVO NOT AVAILABLE (I5) (A6) (I5)

Selected salvo not available. Values are group number, DESIG and preset salvo number.

20 GEOPREP ENCOUNTERED NONEXISTANT DESIG FOR RECOV. BASE (A6)
DEPEN. CORR. (I5)

Subroutine GEOPREP has found a nonexistent recovery base. Check values stored with corridor. Values are offending DESIG and corridor number

Figure 17. (Part 2 of 3)

21 GEOIN ENCOUNTERED NONEXISTANT DESIG FOR RECOV. BASE (A 6)
DEPEN. CORR. (I5)

See message above.

22 ERROR IN SETTING CLAUSE

Clause contains illegal attribute name.

23 ONLY ONE SETTING CLAUSE FOR TARGET ATTRIBUTES ALLOWED

All changes to VALUE, MINKILL, MAXKILL and target IDHOB must be in a single SETTING clause.

24 ERROR IN ONPRINTS CLAUSE

Error in ONPRINTS clause syntax on option number greater than 4.

Figure 17. (Part 3 of 3)

1. The following information is being furnished to you for your information only. It is not to be used for any other purpose.

2. The information is being furnished to you for your information only. It is not to be used for any other purpose.

3. The information is being furnished to you for your information only. It is not to be used for any other purpose.

4. The information is being furnished to you for your information only. It is not to be used for any other purpose.

5. The information is being furnished to you for your information only. It is not to be used for any other purpose.

THE CONTENTS OF THESE PAGES INTENTIONALLY DELETED

SECTION 3. ALOC MODULE

3.1 General Purpose

The major purpose of this module is to determine the optimal allocation of weapons to targets, using a Lagrange multiplier technique. The weapons are divided into weapon groups. A group contains weapons of the same characteristics which are geographically proximate. Thus, weapons are considered identical within groups. Each target is considered individually for weapon assignment. When all targets have been processed, another pass over the targets begins. This process continues until the Lagrange method has allocated all the weapons to the targets. The assignments are then entered in the integrated data base for later processing. The module allows some extent of user control over the allocation process through fixed assignments restrictions on certain weapon groups, and general allocation control parameters.

3.1.1 Modes of Execution. For a given execution of ALOC, several complete passes are made over the target list. During the first pass over the target list many one-time calculations between weapon groups and targets are determined and stored within a data file (called the Weapon/Target Data file). These one-time calculations are continually reread (not recalculated) for each non-first pass over the targets. If there are to be further executions of ALOC and the data base values have not been altered, the created Weapon/Target Data file may be used in lieu of recalculating the one-time calculations. Adverb RECALC (see subsection 3.2) communicates the mode of execution to module ALOC. If RECALC is present, the Weapon/Target Data will be created; otherwise, ALOC assumes the data file to exist.

3.1.1.1 RECALC Mode. In this mode the ALOC module creates the Weapon/Target Data file during the first pass over individual targets. The data contained on the file is then used during successive passes with the file rewound at the outset of each pass. When the file is created the data for it is calculated without reference to any user alterations (for example range modifications) which are input to the ALOC module (there is a parallel file which contains altered data where it is necessary).

3.1.1.2 Non-RECALC Mode. In this mode the ALOC module uses a Weapon/Target Data file created by a previous ALOC run. Experience has shown that many ALOC reruns are due to changes in user directed constraints, data alterations or other changes input to the ALOC module. As noted in 3.1.1.1 above the Weapon/Target Data file is created without reference to these execution time inputs and thus will contain the same data from run to run. The non-RECALC mode takes advantage of this fact by allowing the ALOC module to read the data from the file on pass one as it does on succeeding passes.

3.1.1.3 Mode Selection and JCL Consideration. The users selects the RECALC mode by including the RECALC adverb in the input. If it does not appear, non-RECALC mode will be assumed. In either case, either a tape or file must be included with a file code of 15. If the user wishes to create a Weapon/Target Data file for use on several runs, an appropriate entry should be made in the JCL for file code 15.

3.1.1.4 Non-RECALC Mode Caution. The user should be aware that indiscriminate use of the non-RECALC mode will cause errors. In general, it is best to run ALOC in the RECALC mode following any change to the basic weapon or target data or if any modules which run prior to ALOC are rerun. For example, the Weapon/Target Data file is not likely to be valid between scenarios so that if module DBMOD is rerun with a new value for the SCENARIO attribute ALOC should be run in RECALC mode.

3.1.2 Attack Increment. In the formulation of weapon assignments, ALOC may view either the entire weapon inventory or a selected subset as assignment candidates. In either situation, the complete target list is always available. These methods of allocation permit assignments under the attack increment concept where only certain weapon types are considered for a given execution. This control is through weapon group attribute ATTINC and ALOC input attribute ATTPPOS. ALOC will consider assignments only on those weapon groups where $ATTINC = ATTPPOS$; assume assignments to be fixed where $ATTINC < ATTPPOS$; and ignore all weapon groups where $ATTINC > ATTPPOS$. These settings allow for allocations upon previously finalized allocations. There can be up to nine separate executions of ALOC where any given allocation will have as the starting point the weapon assignments from all previous allocations. Note that after each ALOC execution the user must fix all assignments for further executions of varying values of ATTPPOS. Any execution where $ATTPPOS = 0$ implies all weapon groups are to be considered.

3.2 Input

The verb ALLOCATE initiates execution of the ALOC module. This verb has 11 optional adverbs which the user may use to control ALOC's functions. These adverbs are:

- o FLAGREST User specifies weapon groups which are restricted according to the setting of the FLAG attribute
- o LOCREST User specifies weapon groups which are restricted according to the country location of the target
- o MINRANGE User specifies changes to a group's minimum range
- o MIRVREST User specifies restrictions to MIRV groups according to target class
- o MODRANGE User specifies modification to the range of groups

- o ONPRINTS User selects desired print option and specifies ranges and frequencies for those prints
- o PUNCH User requests output of final Lagrange multipliers
- o READMUL User specifies values for Lagrange multipliers to be used at the outset of ALOC execution
- o RECALC User specifies that the Weapon Data File must be created by ALOC and not read in
- o SETTING User specifies values for ALOC parameters other than their default values
- o SMAT User specifies values for the SMAT array

The ALOC module will execute properly in the absence of any of these adverbs.

3.2.1 The FLAGREST Clause. This clause specifies interaction between weapon groups and the target attribute FLAG which may have a value of 0-9 inclusive. (A value of 0 indicates that no weapon is restricted from that target because of its flag.) In this clause, the user specifies which groups are restricted and what target FLAG values they may or may not attack. The general form of the FLAGREST clause is

```

FLAGREST  group [ 1 group . . . . . 1 group ] { INCLUDE
flag [ 1 flag . . . 1 flag ] { EXCLUDE

```

The adverb may be followed by any number of sets of inputs each consisting of three parts. First a set of one or more group numbers separated by commas are supplied followed by either of the two special words: INCLUDE or EXCLUDE. Third a set of one or more flag numbers separated by commas define entries for attribute FLAG.

The relationship of the group numbers to the flag numbers is specified by the intervening special word. If the word is INCLUDE, then the specified groups are restricted from all but the specified flags. If the word is EXCLUDE, then the specified groups are restricted from the specified flags. For example

```

FLAGREST 1,2,3 INCLUDE 3,4 5,6 EXCLUDE 7,8

```

The result of this example would be that groups 1, 2, and 3 could not attack targets where FLAG values were 1, 2, 5, 6, 7, 8, or 9 and groups 5 and 6 could not attack targets where FLAG values were 7 or 8.

3.2.2 The LOCREST Clause. This clause specifies interaction between weapon groups and the country location code of targets. In this clause, the user specifies which groups are restricted and what target country

locations they may or may not attack. The general form of the LOCREST clause is:

`LOCREST` $\left[\text{. group} \dots \text{. group} \right]$ $\left\{ \begin{array}{l} \text{INCLUDE} \\ \text{EXCLUDE} \end{array} \right\}$
~~`country location`~~ $\left[\text{. country location} \dots \text{. country location} \right]$

The adverb may be followed by any number of sets of inputs, each consisting of three parts. First a set of one or more group numbers separated by commas are supplied followed by either of the two special words: INCLUDE or EXCLUDE. Third a set of one or more country location codes (i.e., US, UR, etc.) separated by commas are entered.

The relationship of the groups to the country codes is specified by the intervening special word. If the word is INCLUDE, then the specified groups may not attack any targets but those with the specified country locations. If the word is EXCLUDE, the specified groups may attack only targets whose country locations are other than those given.

An example of a LOCREST clause:

LOCREST 1,2,3 INCLUDE UR,CH 4,5,6,7 EXCLUDE PO,CZ,BU

The result of this example would be that groups 1, 2, and 3 could only attack targets whose country location codes were "UR" or "CH", and groups 4, 5, 6, and 7 could not attack targets whose country codes were "PO", "CZ" or "BU".

3.2.3 The MINRANGE Clause. This clause allows the user to specify a value for the RNGMIN attribute other than that given for a group. The clause consists of a new minimum range value followed by one or more group numbers. Parentheses are optional. The general form is:

`MINRANGE` (minimum range . group $\left[\text{. group} \dots \text{. group} \right]$)

As many sets of values may appear in a single clause as desired. The user should note that use of this clause alters the value of the RNGMIN attribute for this run of ALOC only and does not alter its data base value in any way. An example of a MINRANGE clause is:

MINRANGE (1000,1,2,3,4) (1500,9,10)

The result would be to set the RNGMIN value to 1000 for groups 1, 2, 3 and 4 and to 1500 for groups 9 and 10.

3.2.4 The MIRVREST Clause. This clause allows the user to specify restrictions for MIRV weapon types. These types may be restricted to particular target classes. In addition to standard classes, they may be restricted to complexes (COMPLE), defended complexes (COMPLD), defended targets (DEFEND) and/or multiple targets (MULTIP).

The general form of the MIRVREST clause is:

MIRVREST (payload name , class [, class . . . , class])

The adverb is followed by any number of sets of values separated by commas. The first value is the name of a MIRV group's payload table. The remaining values are class names of those targets which the indicated group(s) may attack. The parentheses are optional. An example follows.

MIRVREST (MM-III , COMPLE,COMPLD, U/I) (POSEID ,BOMBER)

This effect of this would be to restrict weapons with the payload table name "MM-III" to complexes (defended or not) and target class "U/I". Further weapons with the payload table name "POSEID" would only be able to attack single targets of class "BOMBER". Note: Although this option was designed for MIRV weapons, there is no current restriction which would prevent use of this option for non-MIRV weapon systems.

3.2.5 The MODRANGE Clause. This clause allows the user to alter the data base attributes RANGE and RANGEREf for allocation purposes. The values of RANGE and RANGEREf initially stored within the data base are not altered. Module ALOC conducts the allocation with the user directed multipliers values but this information is not passed to other QUICK processors.

The user supplies multipliers for RANGE and RANGEREf on a weapon group basis. The general form is:

MODRANGE (range multiplier [, refuel range multiplier]
 , group [, group . . . , group])

The clause consists of any number of sets of values. The first value of the set is a multiplier for the RANGE attribute which is followed by the optional slash (/) and a multiplier for the RANGEREf attribute. Following the multipliers are the group numbers to which the multipliers are applicable. Each group number must be preceded by a comma. Numeric sets of multipliers may be defined by leaving at least one space between each data set.

If the multiplier for RANGEREf is omitted it is treated as the same as that for RANGE.

An example of a MODRANGE clause would be:

MODRANGE (.8/.9,1,2,3) (.7,4,5)

The effect would be to multiply the RANGE attribute by .8 and the RANGEREf attribute by .9 for groups 1,2 and 3. Also, both the RANGE and RANGEREf attributes of groups 4 and 5 would be multiplied by .7.

3.2.6 The ONPRINTS Clause. This clause allows the user to control the appearance of various print options. The options available are detailed in table 2. Each option may be selected and the frequency of its appearance(s) controlled as to the pass and/or targets. The control parameters available and their default settings are:

First pass of appearance - default pass 1.
 Last pass of appearance - default pass 9999
 First target of appearance- default target 1
 Last target of appearance - default target 9999
 Frequency of appearance as to target - default every target (1)

In addition, options 1, 2, 4 and 16 are initially selected with the frequency of option 4 set at 50. The user may request that these options not appear. The general form of the ONPRINTS clause is:

ONPRINTS option [, first target - last target / frequency]
 [* first pass - last pass] [NOT option]

This clause has a number of optional forms. Following the adverb the user may input any number of sets of values in various forms. A single number (in the range 1-30, see table 10) will cause that option to appear with default controls. If the user wishes to surpress a default option (i.e., 1, 2, 4, or 16) the option number is preceded by the NOT operator.

User alterations to target control defaults are preceded by a comma. A number following the comma will be used as a first target control. A number preceded by a hyphen will be used as a last target and a number preceded by a slash will be used as a frequency. Only those controls which the user wishes to charge need be included. Similarly, the pass controls are preceded by an asterisk.

For example:

ONPRINTS NOT 4 5,50*-2 6,/4

Would cause option 4 to be surpressed, option 5 to appear beginning with target 50 and for passes one and two, and option 6 to have a frequency of 4.

3.2.7 The PUNCH Clause. This adverb allows the user to request that the final Lagrange multiplier be saved on an output unit. The format used for this output is such that it can be assessed on later runs by the READMUL clause. The general form of the PUNCH clause is

PUNCH [NEW = unit number]

The optional portion is used to specify an output unit other than 43 (system punch).

Table 2. Description of Print Option Numbers
for Program ALOC (Part 1 of 2)

<u>OPTION</u>	<u>DESCRIPTION OF PRINT</u>
1	Input weapon data
2	Main summary prints after weapons have been allocated to target
3	Not used
4	Print for all weapon groups the Lagrange multipliers, the total number of weapons allocated (RNALL), and number of weapons allocated (RNALL), and number of weapons allocated this pass (NALL) with total weapon value and value of error in allocation
5	Print of data on target weights and rates of change of weights
6	Target input data before allocation begins
7	Basic weapon/target interaction data before allocation of weapons to target
8	Risk array before allocation begins on target
9	Summary of weapons assigned to present target and marginal values for each (see option 22 for companion print of potential weapons)
10	Input data to the single target allocator (STALL) -- i.e., output from WAD
11	Initial values for lambdas, VALWPNS and VALERR, at start of module only
12	Debugging print showing synopsis of calculation of actual payoff by WAD
13	Debugging print showing after-the-fact synopsis of potential weapon added and weapon deleted payoff calculations by WAD
14	Not used
15	Not used

Table 2. (Part 2 of 2)

<u>OPTION</u>	<u>DESCRIPTION OF PRINT</u>
16	Defense level and attack mode print for targets with terminal ballistic missile defense
17	Not used
18	Not used
19	Planning factor summary for targets with terminal ballistic missile defenses
20	Summary of WADOUT cost payoff benefit, etc.
21	Complete listing of allocation error estimates (ALLEREST)
22	Summary of marginal payoff data for potential weapons followed by resulting STALL decision: a companion print to print number 9
23	Printout of timing information
24	Memory dump and run termination
25	List of inactive switches for each weapon group as related to current target
26	Print of preferred corridors and computed penetration probabilities for each penetration corridor for all bomber groups relative to current target; available only on first pass
27	Best rate of return for missile allocation in DEFALOC
28	Debugging print of allocations and payoff computed in RESVAL
29	Print of Lagrange multiplier, balance parameter, and stockpile for salvoed missiles
30	Print of bomber payload indicators and allocation fractions

3.2.8 The READMUL Clause. This clause allows the user to specify starting lagrange multipliers for the ALOC module. These multipliers fall into six categories and are all originally set to 1. Through this clause, the user may also specify an input unit created by the punch adverb in a previous run. The general form is

READMUL OLD = unit

<div style="display: inline-block; vertical-align: middle; text-align: center;"> <u>ALL</u> <u>CLASS</u> <u>TYPE</u> <u>REGION</u> <u>GROUP</u> <u>OTHER</u> </div>	, <u>index</u> , <u>lambda value</u>	. . .
--	--------------------------------------	-------

The "OLD" phrase gives an input unit created by PUNCH. Each other value is specified by a set of values the first of which is one of the word shown in the form above, the second is an index identified by the first, and the third is the desired starting multiplier. The ALL form should not have an index. In addition, the user may substitute the alphanumeric name of a weapon type (TYPE) for its index.

3.2.9 The RECALC Clause. This clause consists only of the adverb RECALC. By including this adverb the user indicates that there is no Weapon/Target Data file available from a previous ALOC execution. This adverb should be included, therefore, on any run where no such file exists from a previous run or where alterations in the weapon or target data have rendered the information on the available file invalid.

3.2.10 The SETTING Clause. This clause is a standard SETTING clause applied to the allocation parameters identified in table 3. The default values for these parameters is shown in table 3 also. The user may not alter any attributes other than these parameters via this clause. For example:

SETTING BPENFAC=1 SNSTYTY=.05 PKTX=.95

The setting of values via the SETTING clause alters them only for the particular run of ALOC. After the run they will revert to their original values. The user should note that all attributes identified in table 3, other than ATTPOS, reside in the ALCPRM record which should be preset to its default values at some point prior to the first execution of ALOC. An example of setting these values is:

CHANGE WHERE CLASS = ALCPRM

SETTING IMATCH=0 TARFAC = .1 BPENFAC = 1

PKTX = 0 RADPX = 0 MINDAMAG = 0 FIXOPT = 'TRUE' LOWFAC = 0
 PROBLow = 0 HIGHFAC = 0 PROBHIGh = 0 LAW = 'POWER' TINTFAC = 1
 CORR = .5 CORR2 = 0 FACMIRV = 0 RINTPRD = 2 RATIOINT = 2

Table 3. Input Parameter Card Specifications
(Part 1 of 6)

<u>NAME</u>	<u>RANGE</u>	<u>DEFAULT</u>	<u>DESCRIPTION</u>
IMATCH	Standard integer	0	Controls the method used to determine if a weapon allocation has met the required minimum destruction fraction specified by MINKILL. If IMATCH is 0, the calculation of fraction killed includes the time dependence of target value. If IMATCH is not equal to 0, the fraction calculation does not consider time dependence of target value.
TARFAC	≥ 0.0	0.1	Multiplies the level of terminal bomber defense on each target (TARDEF). Used to increase or decrease all local bomber defenses.
BPENFAC	≥ 0.0	1.0	Multiplies attrition rates for bomber penetration given in the data base. Normally should be equal to 1.0, but can be used to test alternative assumptions without changing the data base.
PKTX	0.0-1.0	0.0	Probability of missile warhead kill by one terminal ballistic missile defense interceptor.
RADPX	0.0-1.0	0.0	Probability of missile warhead kill by a random area ballistic missile defense.
MINDAMAG	0.0-1.0	0.0	Minimum fraction of original value of a target without terminal ballistic missile defenses that must be destroyed by each weapon allocated to the target. If the default option is not used, this constraint may cause nonconvergence by not allowing ALOC to put down all the weapons. The fix for this case is to reduce MINDAMAG or reduce weapon inventory.
FIXOPT	TRUE, FALSE,	TRUE	Fixed assignment option. If TRUE, fix as in data base in FALSE ignore fix requests.

Table 3. (Part 2 of 6)

<u>NAME</u>	<u>RANGE</u>	<u>DEFAULT</u>	<u>DESCRIPTION</u>
LOWFAC	0.0-1.0	0.0	Multiplier of the nominal level of terminal ballistic missile defense. Represents the lower estimate of the Defense level (see PROBLOW).
PROBLOW	0.0-1.0	0.0	Probability that the level of terminal ballistic missile defense is degraded by the factor LOWFAC; e.g.; if the nominal number of terminal BMD interceptors is MISDEF but there is a 25% probability that the actual level of interceptors is half this large, LOWFAC = .5 and PROBLOW = .25. These factors apply to every target with terminal BMD.
HIGHFAC	≥ 0.0	0.0	Serves the same function as LOWFAC, except that it represents the upper estimate of terminal ballistic missile capability.
PROBHIGH	0.0-1.0	0.0	Same function as PROBLOW except that it is the probability of occurrence of the upper defense estimate HIGHFAC.
LAW	SQUARE or POWER		Specifies the form of damage law used on area targets (i.e.; targets with RADIUS > 0.0). If it is equal to SQUARE the square root damage law is used. Otherwise, the power (or exponential) law is used on area targets.
TINTFAC	≥ 0.0	1.0	Acts as a multiplier for the number of terminal BMD defense interceptors over the entire target system.
CORR	0.0-1.0	0.5	Acts as a multiplier for the entries in the SMAT array. Decreasing the value of CORR reduces the effect of interweapon correlations. (With the default SMAT array, the value of CORR should not exceed .5 for good results.)

Table 3. (Part 3 of 6)

<u>NAME</u>	<u>RANGE</u>	<u>DEFAULT</u>	<u>DESCRIPTION</u>
CORR2	0.0-1.0	0.0	Optional, to evaluate the final weapon allocation with a different multiplier for the SMAT array values. Used in conjunction with the user-input parameter IVERIFY.
FACMIRV	0.0-1.0	0.0	Modifies the SMAT array for MIRV systems. For weapons with a MIRV capability, the values of the SMAT array corresponding to the GROUP attribute for failure modes SBL, CC, and REL (see table 4) are increased by the produce of FACMIRV and the unassigned variance for those failure modes. (For the default SMAT array, table 5, the unassigned variance for SBL is .30, for CC is .30, and for REL is .65.) Table 6 provides two examples of the SMAT array for MIRV systems: when the default SMAT array is used in conjunction with FACMIRV = 0.5, and when it is used with FACMIRV = 1.0. For examples of this effect of this parameter see table 6.
RINTPRD	>1.0	2.0	Approximate ratio between rate of change of target weights between different integration periods. An increase in this parameter increases the sensitivity of the multiplier adjustment to recent target experience.
RATIOINT	≥0.0	2.0	Ratio of longest integration period used to the theoretical*--a low value allows higher sensitivity without oscillations in the values of the Lagrange multipliers, but too low a value makes convergence to the correct stockpile sensitive to statistics of the target list. If the target list contains targets with heavy ballistic missile defenses or if a large fraction of the weapons is assigned by the fixed assignment capability, this parameter value should be increased (to 4.0 or above if necessary).

Table 3. (Part 6 of 6)

<u>NAME</u>	<u>RANGE</u>	<u>DEFAULT</u>	<u>DESCRIPTION</u>
ERRCLOS	0.0-1.0	.001	Provides one control of the termination of weapon allocation processing (ALLOCATE function). If $VALERR < VALWPNS * ERRCLOS$, where VALERR is the absolute value of the sum of the Lagrange multipliers for all under-or-over-allocated weapons, and VALWPNS is the sum of the Lagrange multipliers for all weapons in the stockpile, then the weapon allocation process will terminate normally. The complete set of normal terminating conditions for this function is described in the Termination of ALLOCATE Function.
ATTPOS	0-9	0	If = 0 all weapon groups are allocated. If $\neq 0$ only those groups such that $ATTINC = ATTPOS$ are allocated (All fixed assignments take effect regardless of the value of ATTPOS).

SNSTVTY = .1 FSNSTVTY = 1 CLOSE = 1.05 DELTVAL = .005 PRM = .5
STALADJ = .5 CLOSER = 4 QUALITY = .5 IVERIFY = 0
SETTLE = 1 ERRCLOS = .001

The ATTPOS attribute resides in the NUMTBL record and may be changed as follows:

CHANGE WHERE CLASS = NUMBER SETTING ATTPOS = 1

3.2.11 The SMAT Clause. Through this clause the user enters and/or saves values for the SMAT array. The row and column labels for this array and their meaning is shown in table 4. The clause consists of a series of labels and values separated by commas. Each J Index label encountered causes this index to be set. Each I index label has a similar function. When a value is encountered it is entered in the array at the current setting of the I and J indexes. To cause the settings to be permanently entered for later runs the user follows the adverb with the special word UPDATE. An example which would set the SMAT array as per the defaults shown in table 5 would be:

SMAT UPDATE ALL,SBL,0,CC,OREL,0,PEN,0,STK,0,GROUP,0,REGION,0,
CLASS,0,TYPE,0,ALERT,0,PEN,0 REL,0 CC,0,SBL,0,TYPE,.1,CLASS,.4,
REGION,.1,GROUP,.1,CC,.2,REL,.05,PEN,0,REGION,.1,CLASS,.2,
TYPE,.2,REL,.2,CC,.1,CLASS,.1,REGION,.3,REL,0,CLASS,.1

Each value entered should lie between 0. and 1. and the sum of all elements with the same failure mode index J must be less than or equal to 1.

3.3 Output

3.3.1 Standard Output. The printed output of the ALOC module may be divided into four parts: Input prints, standard allocation prints, detailed prints, and debug prints. Most of these may be controlled via user option selection. Those which are not controlled or which always appear at a certain point will be noted as such.

THIS PAGE INTENTIONALLY LEFT BLANK

Table 4. Acceptable Values for SMAT Array Indices

J Index. Failure Modes

<u>J</u>	<u>MNEMONIC</u>	<u>DESCRIPTION</u>
1	SBL	Survival before launch
2	CC	Reliability of command and control system
3	REL	Weapon system hardware reliability
4	PEN	Penetration probability
5	STK	Probability of target kill by warhead

I Index. Weapon Attributes

<u>I</u>	<u>NAME</u>	<u>DESCRIPTION</u>
1	ALL	Shared by all weapons in the stockpile
2	GROUP	Weapons of same class, type, region, and alert status whose launch bases are close to one another
3	REGION	Region of launch base
4	CLASS	Weapon class, either bomber or missile
5	TYPE	Weapon type (e.g., B-52G, Poseidon)
6	ALERT	The alert status of the weapon, either alert or nonalert

Table 5. Default Values for SMAT Array

		ATTRIBUTES						
		I =	1	2	3	4	5	6
<u>J</u>			<u>ALL</u>	<u>GROUP</u>	<u>REGION</u>	<u>CLASS</u>	<u>TYPE</u>	<u>ALERT</u>
FAILURE	1 SBL		0	.10	.10	.40	.10	0
	2 CC		0	.20	.30	.10	.10	0
	3 REL		0	.05	0	.10	.20	0
MODES	4 PEN		0	0	.10	.20	.20	0
	5 STK		0	0	0	0	0	0

Figure 18. ALOC Input Print (Part 1 of 4)

HEADING	LABEL	DESCRIPTION
①		Appears only when ALOC module is in RECALC mode
②		ALOC parameters for this run
③	SMAT ARRAY	SMAT array values used for this run
④	MODIFIED RANGES	Appears only in case of user input of MODRANGE or MINRANGE clause
⑤	GROUP	Number of group
⑥	RANGEMOD	Multiplier for group's RANGE attribute
⑦	REFRNG MOD	Multiplier for group's RANGEREF attribute
⑧	MINRANGE	Replacement value for group's RNGMIN attribute. A value of zero indicates no replacement
⑨	FLAG RESTRICTIONS	Appears only in case of user input of FLAGREST clause
⑩	GROUP	Number of group
⑪	DENIED FLAGS	Value of FLAG attribute for targets group may not attack
⑫	COUNTRY RESTRICTIONS	Appears only in case of user input of LOCREST clause
⑬	GROUP	Number of group
⑭	DENIED COUNTRIES	Value of CNTRYL attribute for targets group may not attack
⑮	MIRV RESTRICTIONS	Appears only in case of user input of MIRVREST clause
⑯	MIRV	Payload table name of MIRV

Figure 18. (Part 2 of 4)

<u>HEADING</u>	<u>LABEL</u>	<u>DESCRIPTION</u>
(17)		Class Names of targets MIRV system may attack
(18)	PRINT REQUESTS	Active print option
(19)	OPTION	Option number
(20)	FIRST	First pass of appearance
(21)	LAST	Last pass of appearance
(22)	FIRST	First target of appearance
(23)	LAST	Last target of appearance
(24)	FREQ.	Frequency of appearance
(25)	--	Timing information for function of first overlay
(26)	INITIALIZE	Initialization function in INITIAL
(27)	OPTS/SMAT	Time spent reading SMAT and/or SETTING clauses
(28)	FLAG/LOC	Time spent reading FLAGREST and/or LOCREST clauses
(29)	MIRVREST	Time spent reading MIRVREST clauses
(30)	PUNCH	Time spent reading PUNCH clause
(31)	PRINT OPTS	Time spent reading ONPRINTS clause
(32)	READML	Time spent reading READMUL clause

Figure 18. (Part 3 of 4)

<u>HEADING</u>	<u>LABEL</u>	<u>DESCRIPTION</u>
(33)	RANGEALT	Time spent reading MODRANGE and/or MINRANGE clauses
(34)	DATGRP	Time spent in subroutine DATGRP
(35)	MISC.FUNCT.	Time spent not accounted for in (26) - (34)
(36)	ACTIVE TIME	Total of (26) - (35)
(37)		Current setting of ATTPOS

Figure 18. (Part 4 of 4)

SECTION 5. MODULE ALOCOUT

5.1 General Purpose

Module ALOCOUT selects optimal aim point offsets for weapons allocated to complex targets and reorders the weapon group assignment chains for use within the Sortie Generation subsystems. For missile groups, the sort is according to salvo number and within salvo, according to attribute RVAL. For bomber groups the new order is a collection of strikes belonging to the penetration corridor that has the largest number of assignments followed by strikes of the penetration corridor that has the next largest number of assignments and so on. Within each collection of strikes belonging to the same penetration corridor, the assignments are further sorted based on attribute RVAL. The user should note that if attribute ATTPOS \neq 0, only those weapon groups where ATTINC = ATTPOS are reordered.

5.2 Input

The only options available to the user in module ALOCOUT are to specify the type and frequency of the various prints and/or to specify the maximum number of iterations to be executed by the generalized function minimizes which is used to select the aim point offsets for those weapons assigned to complex targets. The general command is:

```
DGZSELECT [ONPRINTS option option . . .]  
          [FINDMIN imax]
```

5.2.1 The ONPRINTS Adverb. This adverb selects various print or calculation options. It recognizes any series of numbers (each number separated by at least one blank) with values varying from one to nine. The presence of any of the numbers within the clause selects the corresponding option which are:

- o 1 -- Selects the detailed target print. For this option only a print frequency may be selected. This is entered by placing a slash (/) after the number one followed by the numeric value of the desired print frequency. An entry of 1/10 will print every ten targets. The default entry (1 by itself) prints all targets
- o 2 -- Selects the bomber weapon group summary print
- o 3 -- Selects the missile weapon group summary print
- o 4 -- If entered offsets are not calculated
- o 5 -- Selects the target data input to subroutine DGZSEL print
- o 6 -- Selects the DGZSEL computational value print

- o 7 -- Selects the DGZSEL improvement print
- o 8 -- Selects maintenance prints
- o 9 -- Selects timing information print

5.2.2 The FINDMIN Adverb. If absence the FINDMIN subroutine is not used. If present the FINDMIN subroutine is used and parameter 'imax' is set to the maximum number of iterations.

5.3 Output

5.3.1 Standard Output. All output is optional and must be selected by the user.

5.3.2 Nonstandard Output. Figures 57 to 60 presents the output for print options available to the user within the ONPRINTS clause.

5.3.3 ALOCOUT Error Messages. The error messages for ALOCOUT are shown in figure 61.